In re Appln. of Akiyo[redacted]t al.
Application No. Unassigned

REMARKS

The foregoing Amendment corrects translational errors and conforms the claims to United States practice. No new matter is added.

Respectfully submitted,

LEYDIG, VOIT & MAYER, LTD.

Jeffrey A. Wyand
Registration No. 29,458

Suite 300
700 Thirteenth Street, N.W.
Washington, D.C. 20005
Telephone: (202) 737-6770
Facsimile: (202) 737-6776
Date: March 21, 2002
JAW:ves

PATENT
Attorney Docket No. 401612/ASAHINA

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

AKIYOSHI et al.

Application No. Unassigned

Filed: March 21, 2002

For: WIRE ELECTRODE FOR WIRE ELECTRICAL DISCHARGE MACHINE

Art Unit: Unassigned

Examiner: Unassigned

AMENDMENTS TO SPECIFICATION, CLAIMS AND ABSTRACT MADE VIA PRELIMINARY AMENDMENT

Amendments to the paragraph beginning at page 1, line 13:

In order to increase the machining speed, an example of a wire electrode for a wire electrical discharge machine, wherein core material (i.e., a core) is coated with a layer of Cu-Zn intermetallic compound, is disclosed in HITACHI CABLE REVIEW No. 18 (October 1999). A photograph of a cross section of this wire electrode is shown in Fig. 8. The figure is a magnification of a region near a surface of the wire electrode, wherein the coating layer of Cu-Zn intermetallic compound covering the core can be seen. In Fig. 8, the β phase of the intermetallic compound is seen in a string-like pattern and is surrounded by the α phase. Moreover, the outermost region of the wire electrode consists of only the α phase.

Amendments to the paragraph beginning at page 1, line 24:

The β phase, which has higher Zn concentration than the α phase, has an advantage ~~to increase~~ of increasing machining speed, because the β phase easily evaporates through discharges to blow out object material. On the other hand, the β phase is brittle in a sense of metallography and has a disadvantage that there easily occur cracks during a cold wire drawing process in manufacturing a wire electrode. Since the α phase with superior workability surrounds the β phase with difficult workability, a wire electrode as shown in Fig. 8 can be easily formed ~~to be~~ as a fine wire without any cracks or breaks during a cold wire drawing process.

Amendments to the paragraph beginning at page 2, line 6:

Further, a similar wire electrode for a wire electrical discharge machine is disclosed in Japanese Unexamined Patent Publication No. 300136/1997. Fig. 9 shows concentration of Zn in the radial direction of this wire electrode. ~~Region~~ The region near the surface of the wire electrode consists of the α phase and the Zn concentration is approximately 30 wt. %. In the case where Zn concentration exceeds 40 wt. %, there appears the β or γ phase having a different crystal structure from that of the α phase. At ~~the~~ a depth of 5 to 30 μm from the surface of the wire electrode, the Zn concentration ranges from 35 to 45 wt. % where the α and β phases coexist and the Cu-Zn intermetallic compound with relatively high Zn concentration is formed.

Amendments to the paragraph beginning at page 3, line 3:

The present invention is made to solve the ~~above~~ described problems and an object thereof is to increase Zn concentration in the coating layer and to improve the machining speed. A further object of the present invention is to remove object material efficiently and improve the machining speed and accuracy of machining, by improving the rigidity of the wire electrode and suppressing ~~the~~ vibration during discharge machining.

Amendments to the paragraph beginning at page 4, line 4:

Fig. 4 is a graph showing a relationship between the thickness of a coating ~~layer 3~~ of Cu-Zn alloy in the α phase and machining speed;

Amendments to the paragraph beginning at page 4, line 7:

Fig. 5 is a graph showing a relationship between the thickness of a coating ~~layer 2~~ of Cu-Zn intermetallic compound in other than the α phase and machining speed;

Amendments to the paragraph beginning at page 4, line 10:

Fig. 6 is a graph showing machining speed of a wire electrode for a wire electrical discharge machine according to embodiment 2 of the present invention, ~~comparing~~ compared with that of the conventional wire electrode;

Amendments to the paragraph beginning at page 4, line 14:

Fig. 7 is a graph showing machining speed of a wire electrode for a wire electrical discharge machine according to Embodiments 3 and 4 of the present invention, ~~comparing~~ compared with that of the conventional wire electrode;

Amendments to the paragraph beginning at page 4, line 18:

Fig. 8 is a magnified photograph showing a cross section of the conventional wire electrode for a wire electrical discharge machine; and

Amendments to the paragraph beginning at page 4, line 20:

Fig. 9 is a graph showing Zn concentration in a radial direction of a cross section of a conventional wire electrode for a wire electrical discharge machine.

Amendments to existing claims:

1. (Amended) A wire electrode for wire electrical discharge ~~machine characterized in that the wire electrode has~~ machining including a ~~three-layered~~ three-layer structure comprising an ~~electroconductive~~ electrically conductive core ~~(1)~~, a first coating ~~layer (2)~~ of Cu-Zn ~~intermetalic~~ intermetallic compound in other than an α phase surrounding the core ~~(1)~~, and a second coating ~~layer (3)~~ of Cu–Zn alloy in the α phase on the ~~exterior of the~~ first coating ~~layer (2), and that the thickness of~~ wherein the second coating ~~layer (3) is~~ has a thickness in a range from 5 to 15 μm.

2. (Amended) The wire electrode for wire electrical discharge ~~machine~~ machining according to Claim 1, ~~characterized in that~~ wherein the first coating ~~layer (2)~~ comprises Cu-Zn alloy in a β phase.

3. (Amended) The wire electrode for wire electrical discharge ~~machine~~ machining according to Claim 1, ~~characterized in that~~ wherein the core ~~(1)~~ comprises Cu-Zr alloy.

4. (Amended) The wire electrode for wire electrical discharge ~~machine~~ machining according to Claim 2, ~~characterized in that~~ wherein the core ~~(1)~~ comprises Cu-Zr alloy.

5. (Amended) The wire electrode for wire electrical discharge ~~machine~~ machining according to Claim 1, ~~characterized in that~~ wherein the core ~~(1)~~ comprises Cu-Zn alloy.

6. (Amended) The wire electrode for wire electrical discharge ~~machine~~ machining according to Claim 2, ~~characterized in that~~ wherein the core ~~(1)~~ comprises Cu-Zn alloy.

Amendments to the abstract:

ABSTRACT

~~The present invention aims to increase concentration of Zn in a coating layer to enhance machining speed. Moreover, the present invention aims to perform removal of object material efficiently and enhance machining speed as well as accuracy in machining by increasing rigidity of the wire electrode to suppress vibration thereof during machining process.~~

~~The present invention is characterized in that the~~A wire electrode for ~~wire~~ electrical discharge ~~machine is constituted as~~ machining has a three-layered structure of an ~~electroconductive~~ electrically conductive core ~~(1)~~, a first coating ~~layer (2)~~ of Cu-Zn ~~intermetaric~~ intermetallic compound in other than an α phase, and a second coating ~~layer (3)~~ of Cu-Zn alloy in the α phase on ~~the exterior of~~ the first coating ~~layer (2), and that the~~. The thickness of the second coating ~~layer (3)~~ is ~~set to~~ 5 to 15 μm. ~~Furthermore, the~~ The first coating layer ~~(2)~~ is preferably Cu-Zn alloy in a β phase. ~~Moreover, the~~ The core ~~(1)~~ is preferably ~~made of~~ Cu-Zr alloy.